

This appears to be the species referred with doubt by Canon Tristram* to "*Psammomyx tamaracinus*, Kuhl," but is certainly not the true *Meriones tamaracinus*, Pall., a very much larger and heavier animal. Its nearest ally is perhaps *M. meridianus*, Pall.; but neither that nor any other species with which I am acquainted has such a narrow slender skull, so little broadened posteriorly. Its small and narrow bullæ also distinguish it from all its allies.

XXVI.—*The Polyzoa of the St. Lawrence: a Study of Arctic Forms.* By the Rev. THOMAS HINCKS, B.A., F.R.S.

[Plate VIII.]

[Continued from vol. iii. p. 433.]

Flustra solida, Stimpson. (Pl. VIII. figs. 1.)

Flustra solida, Stimpson, Marine Invertebrata Grand Manan, 1853; Hincks, "Polyzoa from Barents Sea," Ann. & Mag. Nat. Hist. 1880, ser. 5, vol. vi. p. 282, pl. xv. figs. 2, 3.

Eschara palmata, Sars, Beskriv. over nogle norske Polyzoer, 1862.

Escharella palmata, Smitt, Krit. Förteckn. öfver Skand. Hafs-Bryozoer, 1867.

Flustramorpha solida, Verrill, Proc. U.S. Nat. Mus. 1879.

This very interesting species occurs amongst the St.-Lawrence dredgings; it was obtained off Bear Head, Anticosti, at a depth of 120 fathoms. Besides the form described by Sars a small variety was met with which presents some notable peculiarities, to which I shall refer hereafter.

Zoarium erect, bilaminate, branched, attaining a height of about 3 inches, in the adult state composed of broad transversely separated segments, held together by epidermal tubular fibres, which traverse the surface of the zoarium and unite in their course downwards, so as to form cords of many strands, and ultimately give origin at the base of the fibrils by which the colony is attached to its site. *Zoecia* linear-oblong, narrow, and usually of great length, inclosed by strongly marked boundary-lines and perforated round the sides, very moderately convex, surface smooth, commonly invested by an epidermal membrane, orifice broader than high, upper margin very slightly arched, sides nearly straight, lower margin decidedly curved outward, an articular process at each

* P. Z. S. 1866, p. 89.

extremity of the marginal curve, peristome not raised; immediately below the orifice an elongate linguiform *avicularium*, about a third of the cell in length, or sometimes (in the case of the dwarfer cells) about half the length, mandible pointing downwards. *Oeciium* broader than high, rounded above, and narrowing slightly towards the front, surface smooth and silvery, a number of roundish perforations and (in some cases) of narrow elongate fissures round the lower part of it, the central portion entire, or with a few scattered punctures.

Range. Spitzbergen; Greenland; Finmark; St. Lawrence; Barents Sea; Grand Manan.

The smaller form to which I have referred as occurring in the St. Lawrence is characterized by a very slender habit and by the narrowness of the segments which compose the zoarium. These differences might only indicate an earlier stage of growth, but there are others of more significance. There is a remarkable dissimilarity in the shape of the orifice. In the larger form (of which we have an admirable description from the elder Sars) it is subquadrangular ("rotundatoquadrangularis," Smitt), and the lower margin is occupied by a wide and shallow sinuation, stretching between the articular denticles (Pl. VIII. fig. 1 *b*). In the smaller form the orifice is rather taller than broad, the upper margin moderately arched, and the sides slightly curved, while in the centre of the inferior margin there is a small but distinct rounded sinus (Pl. VIII. fig. 1 *a*). I was at first inclined to think that the latter might be a merely peristomial structure; but on detaching the opercula they were found to be furnished below with a projecting process corresponding exactly with the sinus. The orifice in this form is much more slender than in the other, and generally of a very different character. Notwithstanding these important differences it is difficult to believe that we are dealing with distinct species when we remember the remarkable similarity between the two forms in most of their characters. There is a difference, it is true, between the avicularia on the front wall, which produces an effect on the general aspect out of all proportion to its intrinsic importance. In the smaller form they are of very moderate size, and either circular or oval; in the other they are (prevalingly) large and linguiform. But such varieties of shape are too common amongst avicularian structures to have much systematic weight. Smitt long ago noticed the variability of the avicularium in his *Escharella palmata*, which was founded on the larger of the two forms with which I am dealing. His figures represent only a subquadrangular orifice. The

Eschara palmata of Sars seems to be referable to the same form*.

On a consideration of the whole question I can only suggest that probably we have to do with one of the species in which the orifice of the cells bearing the œcium differs in structure from that of the ordinary cells. The larger specimens both from Barents Sea and the St. Lawrence were thickly covered with œcia, and on these I have been unable to find an example of the orifice with the central sinus. On specimens of the smaller form from the St. Lawrence the latter was universally present. At the same time it must be admitted that the exclusive presence of one form of cell throughout fine and well-developed colonies affords a presumption against the explanation which I suggest. In similar cases the two classes of cell are always, so far as I know, mingled together. The alternative view would be that these forms are distinct species, which seems to be highly improbable.

Opinions have differed widely as to the precise systematic position of *Flustra solida*. Stimpson, who first described it, referred it to *Flustra*, to which it bears a certain amount of superficial resemblance; but there is no real affinity between the two. Sars ranked it in the old genus *Eschara*, simply on the ground of its zoarial habit, whilst Verrill placed it in the *Flustramorpha* of Gray, a genus since adopted by Busk for forms with a Microporellidan cell and an erect mode of growth. Such a genus can of course find no place in our later systems of classification †.

Smitt has discussed the affinities of this species in the light of the new views of which he has been so able an expositor, and assigns it a place in his genus *Escharella*, which (as finally limited) is identical with *Smittia* ‡. Undoubtedly there are points in which it agrees with the members of this genus, though the differences are by no means unimportant.

The orifice in such a species as *Smittia reticulata* before the development of the peristome bears the closest resemblance to that of *Flustra solida* in its larger form, the presence of a central denticle and of marginal spines being the only points of difference §. But Prof. Smitt had not met with the other form of orifice carrying a sinus on the lower margin, which

* In Stimpson's figure the avicularium is represented as small and suborbicular.

† Verrill makes the presence of "chitinous fibres strengthening the zoarium" the distinctive generic character. But this is common to many very dissimilar forms.

‡ 'British Marine Polyzoa,' vol. i. p. 341.

§ 'History of British Marine Polyzoa,' pl. xlvi. fig. 4.

indicates affinity with the Schizoporellidæ. Should further examination show that the orifice in *Flustra solida* is dimorphous, as it is in many of the Cheilostomata, and that the two forms which I have described are referable to one species, it will probably find a place in the above family. Unfortunately I have only had immature fragments of the so-called "smaller form," and though they have enabled me to ascertain with accuracy the structure of its cell-mouth, they do not furnish the means of determining with certainty the relation between the two forms.

A striking characteristic of *F. solida* is the epidermal covering of a uniform greyish tint which invests the surface of the zœcæia and occasionally of the oœcium also, though this is more usually free and retains its silvery lustre. The chitinous fibres which hold together the detached segments of the zoarium and also give origin to the organs of attachment are tubular extensions of the membranous covering of the cell * (Pl. VIII. fig. 1 c).

Monoporella spinulifera, Hincks, var. (Pl. VIII. fig. 3.)

Mucronella spinulifera, Hincks, "Polyzoa of the St. Lawrence," 'Annals,' May 1889, p. 431, pl. xxi. fig. 3.

This species was described and figured in the last part of this series of papers; but I have since met with a strongly marked variety (Pl. VIII. fig. 3), which should not be passed without notice.

Var. *praclara*.—*Zoœcia* much larger than in the common form, more convex and deeply divided; immediately below the orifice a large umbo, which frequently rises to a considerable height; oral denticle wanting.

The large size of the cell, the suboral umbo, and the absence of so distinctive a feature as the spinule on the lower margin materially affect the general appearance of the zoarium.

I have ranked this species in the genus *Mucronella*; but on reconsideration I am inclined to think that its affinities are rather with *Monoporella*.

Smitt has described and figured *M. spinulifera* † under the name *Discopora cruenta*, identifying it with the *Lepralia cruenta*, Norman, from which it differs essentially. He had

* See a paper by the author, "On new Hydroida and Polyzoa from Barents Sea," 'Annals' for October 1880, p. 282.

† "Kritisk Förteckning öfv. Skandinavien's Hafs-Bryozoen," (Eiwersigt af Kongl. Vetensk.-Akad. Förhandl. 1871.

previously ranked it as a form of *Microporella ciliata* ("forma dura")*. His figure of *Discopora cruenta* is a very good representation of the present species.

A peculiarity of the oecium must not be omitted; the thick granular collar which incloses the orifice of the cell is carried up on each side, covering the lower part of the oecium and concealing its oral arch. This is shown, though only partially, in the figure accompanying my last paper ('Annals,' ser. 6, vol. iii. pl. xxi. fig. 3).

The surface of the cells as calcification proceeds becomes granular and glistening; but in earlier stages it is thickly covered with minute pores, a line of somewhat larger size running round the margin.

Schizoporella cruenta, Norman (sp.). (Pl. VIII. fig. 5.)

Lepralia violacea, var. *cruenta*, Busk, B. M. Cat. pl. cx. fig. 1.

The figure of this species, taken from a St.-Lawrence specimen (Pl. VIII. fig. 5), shows a much more rugged condition of the surface than I have met with before. Even Busk's excellent figure, in which the two large nodules below the orifice are represented, gives no adequate idea of the extent to which these elevations of the surface may be developed. The suboral nodules seem to be almost always present on adult zoecia; but in addition to these one is sometimes placed near the bottom of the cell, whilst the thickened upper margin of the peristome, which in its simplest condition is carried up into a central peak, is commonly broken up into two or more of the nodular prominences. At the same time the whole surface is furrowed and ridged and granulated.

The margin of the cell is occupied by a line of very large pores and a number are scattered over the front wall. The zoecia near the margin of the colony are comparatively smooth and flattish and the nodules upon them merely rudimentary.

The figure of *S. cruenta* in my 'Hist. Brit. Mar. Polyzoa' was taken from a specimen in which calcification was not redundant, and does not present what must probably be considered the more usual aspect of the species.

A question may be raised as to the systematic position of this form. I have placed it in the genus *Schizoporella*, on the ground that "the orifice of the young cells is slightly

* "Kritisk Förteckn. &c., Öfversigt af Kongl. Vet.-Akad. Förhandl 1867, Bilhaug, p. 61, pl. xxiv. fig. 17.

sinuated in front," or, as the character is given in the diagnosis, "slightly channelled in front."

This character is not very strongly marked, and in the more highly calcified condition of the cell is often difficult to detect. On young zoœcia in the marginal region of the colony a shallow rounded sinus may be detected, though even amongst these cells not unfrequently occur in which the margin has all the appearance of being entire. In the case of older zoœcia, which are overlaid by a thick calcareous crust and the orifice is sunk in a comparatively deep shaft, the sinus will often be sought in vain.

It is right to add that Mr. S. O. Ridley, who obtained the species from Franz-Joseph Land, found the oral sinus "well marked in most, even old cells" *.

Lepralia pertusa, Esper. (Pl. VIII. fig. 7.)

There seems to have been a good deal of uncertainty about this species; I have therefore given a figure taken from a fine St.-Lawrence specimen in which the characters are well displayed. Smitt, in one of his later works †, identifies it with his *Escharella porifera* (a near ally, if not a mere variety, of *Smittia Landsborovii*), from which it is separated by important differences. Of Busk's figures one or two are referable to another species. Waters, in his 'Bryozoa of the Bay of Naples,' has recorded two varieties of *Lepralia pertusa*, both of which probably are quite distinct from Esper's species.

Schizoporella cincta, Hincks, var. (Pl. VIII. fig. 2.)

Lepralia cincta, 'Annals,' ser. 5, vol. xv. p. 254, pl. viii. fig. 6.

A variety of this New-Zealand species occurs amongst the St.-Lawrence dredgings which is distinguished by a peculiar condition of the cell-wall in the immediate neighbourhood of the avicularium. In the typical form a prominent umbo rises immediately below the orifice, bearing on its summit an elongate pointed avicularium, placed transversely. In the variety the umbo has disappeared or is reduced to a very slight and inconspicuous elevation forming part of a distinct area of the cell-wall, extending to a greater or less distance below the orifice, sometimes almost orbicular, sometimes elongate and stretching down about half the length of the cell. This area

* 'Annals' for June 1881, p. 449.

† Ofvers. Kongl. Vet.-Akad. Förhandl. 1878.—No. 7. Bryozoa from the Arctic Sea (Peninsula of Kola).

differs remarkably in appearance from the rest of the cell, which is of a brown colour and thickly covered with pores. It is smooth, dense, and of a whitish colour, showing very distinctly on the dark front wall. The avicularium lies across the upper part of it, immediately under the lower margin of the orifice, slanting slightly upwards. The whole structure probably represents the umbo of the normal form. Its effect on the general appearance of the cell is very striking.

The orifice in this species is wide and well arched above, but below the articular denticles, which are placed more than halfway down, it narrows off and terminates below in a curved line. The structure of the orifice would seem to connect it with the genus *Schizoporella* rather than *Lepralia*.

Membranipora armifera, Hincks. (Pl. VIII. fig. 4.)

Membranipora armifera, Hincks, "Contributions towards a General History of the Marine Polyzoa," "Annals," ser. 5, vol. vi. p. 82, pl. xi. fig. 5.

Some time since I described a species of *Membranipora* from the St. Lawrence under the above name; but it now appears that the specimen was immature on which the description was founded. Fortunately the occurrence of the perfect form enables me to revise and complete the diagnosis.

Zoecia ovate, quincuncial, wholly membranous in front, margin rather wide, the inner border crenulate, two spines at the top, on each side (or sometimes on one only) a little below the upper margin an acute *avicularium*, placed obliquely on the top of a prominent bracket-like support, carinate in front, mandible directed downward, a tall and very stout articulated spine rising from the margin close to one or (occasionally) both of the lateral avicularia, immediately below the cell a large mounted avicularium. *Oocidium* rather large, much broader than high, surface smooth and entire, a prominent rib across it a little above the oral arch, and at the top a large elongate avicularium placed obliquely and stretching along one side of the cell above, mandible pointed.

Hab. On shell and stone, and incrusting *Flustra membranaceo-truncata*, Smitt.

Commonly only one of the lateral avicularia is present, and the large articulated spine takes the place of the other. In some cases both avicularia are present, each with an attendant spine. When the oocidium is developed it adheres to the avicularium at the base of the cell above, which appears as if it were a part of it.

This species is nearly allied to *M. unicornis*, Fleming.

Porella concinna, Busk (granular var.).
(Pl. VIII. fig. 6.)

I have already referred to the variability of this species in superficial character. The figure represents a highly granular form, which I had supposed to be (probably) the *Lepralia Belli* of Sir J. W. Dawson*. The latter indeed is described as having a sinuated orifice, a character which does not belong to any variety of *P. concinna*. Still it seems more than probable, taking all things into consideration, that *L. Belli* is nothing more than a form of this variable species. Specimens are of common occurrence in which the cells are separated by a distinctly "sinuous furrow," which is one of the diagnostics of Sir W. Dawson's species.

Cellepora canaliculata, Busk.

Cellepora canaliculata, Busk, 'Challenger' Report, part i. p. 204, pl. xxx. fig. 5.

This species seems to be not uncommon. It forms small nodular masses, which incrust the stems of Hydroida. It was first obtained on the 'Challenger' voyage in the neighbourhood of Halifax, Nova Scotia, in 51 fathoms.

The *ovarium* was not observed. It is globose, of comparatively large size, much broader than high, rather prominent in front, oral arch wide and shallow, surface smooth, shining, entire.

Logenipora spinulosa, Hincks.

Logenipora spinulosa, Hincks, "Polyzoa of Queen Charlotte Islands," p. 31 (sep.) and 40: 'Annals,' ser. 5, vol. xiii. pl. iii. fig. 4, and pl. ix. fig. 4.

This very interesting form occurs abundantly. It has only been noticed previously amongst Dr. G. M. Dawson's dredgings from the Queen Charlotte Islands. It is probably an Arctic form. The St.-Lawrence specimens hitherto met with are all crustaceous in habit, overspreading the stems of Hydroida. The erect branching form obtained at the Queen Charlotte Islands has not occurred.

Smittia Landsborovii, Johnston.

There has been some confusion about this species, and the identification is not always to be trusted. Smitt has ranked

* 'Contributions to Canadian Natural History,' by W. S. M. D'Urban and Robert Bell; Polyzoa, p. 32. (Extracted from the Report of the Geological Survey for 1858: Montreal, 1860.)

two or three forms under it which must, I think, be accounted distinct*. Amongst the St.-Lawrence dredgings the true typical form is not by any means common; the species is represented chiefly by the variety *porifera* of Smitt. One specimen has occurred to me which, in addition to the ordinary characteristics of *S. Lundsborovii*, is furnished with the large spatulate avicularia, which are rarely developed and always in connexion with the œcium.

Myriozoum planum, Dawson.

Myriozoum crustaceum, Smitt, Krit. Förteckn., Öfversigt Kongl. Vet.-Akad. Förh. 1867, Bihang, p. 114.

This species was first described as *Lepralia plana* by Sir J. W. Dawson in 1858. His account of the species is contained in a paper on the Polyzoa of the Gulf of St. Lawrence, published in the Report of the (Canadian) Geological Survey for 1858. It was afterwards (1860) reprinted along with other papers on the fauna of Canada by Messrs. D'Urban and Robert Bell, under the title 'Contributions to Canadian Natural History.' This paper seems to have been entirely overlooked, and in 1867 Prof. Smitt described the present form under the name of *Myriozoum crustaceum*. Sir W. Dawson's diagnosis may not be as full and minute as we should now desire, but it indicates the general character of the species, and his name has as good a claim to be retained as those of a large proportion of the older writers.

EXPLANATION OF PLATE VIII.

Fig. 1. *Flustra solida*, Stimpson, with sinus. 1a. Outline of orifice of smaller form. 1b. Ditto of larger form. 1c. Showing the connexion between the epidermal covering of the cell and the tubular fibre.

Fig. 2. *Schizoporella cincta*, Hincks, var.

Fig. 3. *Monoporella spinulifera*, Hincks, var. *preclara*.

Fig. 4. *Membranipora armifera*, Hincks.

Fig. 5. *Schizoporella cruenta*, Norman.

Fig. 6. *Porella concinna*, Bisk, granular variety.

Fig. 7. *Lepralia pertusa*, Esper.

XXVII.—On the Development of *Dreissena* polymorpha, Pallas. By Dr. EUGEN KORSCHOLT †.

THE development of *Dreissena* is particularly interesting because, for reasons which will be discussed forthwith, we

* Brit. Mar. Polyzoa, p. 345.

† Translated from a separate impression from the 'Sitzungs-Berichte der Gesellschaft naturforschender Freunde,' no. 7, Jahrg. 1891, pp. 131-146. Communicated by the Author.